APPLICATION GUIDE FOR THE PREPARATION OF DETAILED PABX EQUIPMENT REQUIREMENTS

CONTENTS

1. GENERAL

1.1 This section provides REA borrowers, consulting engineers, contractors, and other interested parties with technical information for use in the design and construction of REA borrowers' telephone systems. It discusses in particular the design of Private Automatic Branch Exchanges.

1.2 The discussion that follows has been prepared to assist the borrower or its engineer in the completion of the detailed specification as the basis for an equipment contract.

1.3 This section is being reissued to agree with the new issue of REA Form 528. Form 528 was reissued to include more specific parameters for PABX systems such as transmission, traffic, features, and surge protection.

1.4 Explanation of Numbers in Parentheses

1.41 Item numbers shown in parentheses refer to items in Part IV of the specification.

2. NUMBER OF STATION LINES (ITEM 2)

2.1 The data to be entered in item 2.1 should show the number of station lines to be equipped initially and the anticipated ultimate number of lines. The external resistance of the longest loop, measured from the distributing frame in the office and excluding the telephone set, should be shown in item 2.13. This

information will enable the supplier to propose a PABX with sufficient range to meet the requirements. The loop resistance limits vary widely with various types of equipment.

2.11 The number of extensions which will require surge protection and be of a range exceeding that in item 2.13 are listed in item 2.14 with their loop resistances. Any requirements for voice frequency amplification or other special needs for these extensions must be specified in item 11.

3. TRUNK REQUIREMENTS (ITEM 3)

3.1 Number of City Trunks (Item 3.1)

3.11 The number of city trunks, which connect the PABX with the central office, are shown in the initially equipped quantity in item 3.11. The anticipated ultimate number is shown in item 3.12.

3.12 The type of central office in which the city trunks from the PABX terminate should be shown in item 3.13.

3.2 Number of Tie Trunks to Another PABX or PBX (Item 3.2)

3.21 When the traffic between two or more PABX offices is heavy, it is customary to connect them directly with dial-to-dial or dial-to-manual tie trunks. The number of tie trunks required initially is shown in item 3.21, and the number estimated for the ultimate requirement is entered in item 3.22.

3.22 Show the type of distant PABX office in which the tie trunks terminate, whether manual or dial, in item 3.23.

3.23 The type of signaling and direction of the tie trunks is in item 3.24. This must be coordinated with the requirements of the distant PABX.

3.3 Number of Foreign Exchange Trunks (Item 3.3)

3.31 If the office to which the trunks from the PABX are connected is a foreign exchange, the number of such trunks required initially should be shown in item 3.31 and the ultimate number should be shown in item 3.32 and the type of outpulsing in item 3.33.

3.32 Show the type of distant office in which the foreign exchange trunks terminate, whether manual or dial, in item 3.34.

3.4 Number of WATS Lines (Item 3.4)

3.41 When WATS lines are to be equipped the initial number of in WATS lines equipped is shown in item 3.411 and the ultimate number in item 3.412. The number of out WATS lines initially equipped shall be shown in item 3.421 with the ultimate number in item 3.422.

3.42 The WATS system is divided into zones. These zones have different rates depending on their distance from the PABX. It may be economically advantageous to have this type of lump billing rather than individual toll calls. The zones required are shown in item 3.423. If there are special stations with different class mark requirements concerning WATS usage, describe details in item 11.

3.5 PABX Trunk Groups with Consecutive Number Hunting (Item 3.5)

3.51 A group of lines in a PABX may be so arranged that if the first line is dialed and is found busy the second line will automatically be selected, and if it is found busy a third line will be selected and so on to the ultimate number of lines in the group. A group may be assigned two or more lines. Show the number of groups with automatic consecutive number hunting in item 3.51 and the number of lines in each group in item 3.52.

4. NUMBERING (ITEM 4)

4.1 In many cases when a PABX is replaced it will cause a minimum of disruption if the same station numbers can be maintained. This would be very important in an application such as a factory. Designate here what the present series of numbers is plus what series for additional lines. This should be shown in item 4.1.

4.11 If the series of numbers is to correspond with rooms in a motel or hotel, which is extremely convenient operation, check item 4.11 and give exact numbers desired in item 10.121.

4.2 The normal access to city trunks is "9". If other than that is desired, give the code in item 4.2.

4.3 The tie lines are usually accessed by special codes. These codes should be shown in item 4.3. If additional groups are needed, please add.

4.4 The special codes that will be required to access the special features required in item 10 are to be shown in item 4.4. Some equipment may have these codes preset; therefore, coordination with the Bidder or Bidders is desirable where the choice of codes is not mandatory.

5. TRAFFIC (ITEM 5)

5.01 Traffic on PABX systems tends to be in excess of that encountered in central offices. The trunk traffic is also higher than the station-to-station traffic in the greater number of cases. If there is any possibility of making a traffic study before completing these items, it will be most desirable, Guessing could cause the loss of an order if too much traffic is provided, or an extremely unhappy customer if too little is provided. Under any circumstances in purchasing a PABX, the borrower and its engineer should not accept a system which does not leave room for expansion beyond the traffic requirements shown in this paragraph.

5.02 (Item 5.01)

The initial traffic per station is to be shown in item 5,01. If a traffic study is unavailable and no other means of estimating usage is possible, the likely ranges for two-way traffic per station line are as follows:

Small Size PABX (10 to Maximum 200 Stations)	- 3 to 5 CCS
Medium Size PABX (200 to Maximum 1000 Stations)	- 4 to 6 CCS
Large Size PABX (800+ Stations)	- 6+ CCS

5.03 (Item 5.02)

The ultimate traffic per station will depend heavily on the potential for growth of the business served by the PABX. For instance, a factory which has a potential for growth as a market for its product develops may have a rapid and large rate of growth in traffic per station, whereas a motel probably will have no growth. A range of 10 to 20 percent increase will probably suffice in most cases.

5.04 (Item 5.03)

The amount of traffic expected between the city and the PABX is shown in item 5.03 in order that the Bidder can determine the number of trunks necessary. If this traffic is to be carried by one-way trunks, item 5.031 is used to show the division of the traffic.

5.05 (Item 5.04)

The percentage of city trunk traffic to internal traffic is shown in item 5.04. Do not involve the WATS traffic and the tie line traffic, unless there are only a couple of tie lines, in this percentage. A reasonable figure, once again depending on the nature of the business, is about 70 percent.

5.06 (Item 5.05)

Traffic expected on tie lines is shown in item 5.05. In many cases the tail will wag the dog and the number of tie lines will be fixed by parameters and costs that do not involve traffic. If this second situation exists it should be noted in item 11 with reference in item 5.05.

5.07 (Item 5.06)

The percent of stations which will use pushbutton phones is shown in item 5.06. The normal case is that if any pushbutton phones are used, all lines will be pushbutton.

5.08 (Item 5.07)

The purpose of item 5.07 is twofold. It determines the quantity of registers in most systems and also tells the supplier if he must convert any pushbutton phones to dial pulses if the city is unable to accept DTMF dialing.

5.09 (Item 5.08)

The traffic for WATS lines is shown in this item. In many cases the number of WATS lines is determined by other than traffic. The economics of how many lines the PABX user wishes to pay for and how much inconvenience can be tolerated by users waiting a turn to access the WATS lines are very important factors. Where reasons other than traffic controls the number of WATS lines, this should be explained in item 11.

5.10 (Item 5.09)

Traffic from stations to attendant is shown in item 5.09. This will vary widely even in similar size systems depending on the user's requirements as to operating procedures. Things that will have an effect are: how much of the outward city traffic will the attendant have to complete because of station blocking from direct access to city trunks; will conferences be automatic; will the attendant do all paging; will the attendant originate all outward WATS calls; will the attendant be used in completing a significant number of toll calls, etc.

5.11 (Item 5.10)

If the system is to be traffic sensitive enough to require constant monitoring, then item 5.10 should be checked. When there are special meters or some of the meters shown in REA Form 528a, paragraph 7.32, are to be deleted, the details should be given in item 11.

6. ATTENDANT'S EQUIPMENT (ITEM 6)

6.1 (Item 6.01)

The attendant's cabinet may be either a turret type for placing on a table or desk or it may be a floor-mounted console. The type desired is indicated in this paragraph. The usual modern PABX has a turret type attendant's cabinet.

6.2 (Items 6.02 - 6.05)

Items 6.02 through 6.05 are to help the supplier dimension the attendant's cabinet for its access to trunks and tie lines.

6.3 (Items 6.06 - 6.07)

Items 6.06 and 6.07 are to determine what type of night answer the turret is to be equipped with.

6.4 (Items 6.08 - 6.082)

Items 6.08 through 6.082 are concerned with a manual conference which would be set up by the attendant. If only one dial-up conference is required, then these items will be left blank.

6.5 (Items 6.09 - 6.11)

Items 6.09 through 6.11 are self-explanatory.

6.6 (Item 6.12)

Item 6.12 is to determine the length of the cable used for the turret. These cables may be special, particularly in the case of digital systems, plus their length may be critical; therefore, care should be taken in determining this length.

7. MAIN DISTRIBUTING FRAME (ITEM 7)

7.1 Most PABX suppliers are not set up to provide main frame protection and depend on the telephone company to be responsible. If this is the case, then item 7.1 should be checked and with exception of item 7.9 no further paragraphs need be completed under this heading.

7.2 If the PABX supplier is to furnish the MDF then the following paragraphs apply.

7.3 (Items 7.2 - 7.3)

The outside cable plant is usually brought into a distributing frame where the cable pairs may be cross-connected to the lines of the switching equipment. If the size of the PABX is small, for example under 100 lines, a wall-type distributing frame will usually be sufficient. In this case, check item 7.2. Larger PABX's will probably be better served by a floor-type distributing frame and item 7.3 should be checked.

7.4 (Items 7.4 - 7.41)

The total number of outside cable pairs to be brought into the main distributing frame and terminated should be shown in item 7.4, and the wire gauge of these pairs in item 7.41.

7.5 (Item 7.5)

If the outside plant is exposed to crosses with power lines or to lightning, such exposed pairs should have adequate protection at the main distributing frame. Refer to REA TE&CM 810, "Central Office Electrical Protection." Pairs not exposed need not be protected. The total number of pairs which require protection should be shown in item 7.5.

7.6 (Item 7.6)

Exposed pairs connected to the main distributing frame, but not assigned to switchboard lines, may be multipled together and connected to ground. The number of such pairs should be shown in item 7.6.

7.7 (Item 7.7)

If certain types of special electronic or switching equipment are sensitive to surge voltages of less than those specified in paragraph 4 of Part I, or if the PABX is an unattended one located in a high lightning area (see TE&CM 823), then gas tube protectors must be used. Insert the number of gas tube protectors in this item.

7.71 (Item 7.71)

Gas tubes are rated as light, standard, or heavy duty, according to their energy handling ability. Their cost is usually directly proportional to this characteristic. Unless extensive power contact exposures or severe lightning problems are anticipated, light or standard duty tubes should be sufficient. Enter in item 7.71.

7.72 (Item 7.72)

In station protectors, or other locations where protection of life or a subscriber's property is of prime concern, tubes which fail by the shorted or low breakdown modes are required. Where only equipment is being protected, however, as in a central office, the user may opt for less expensive tubes which do not guarantee these failure modes but could fail in the high breakdown mode. It should be understood that, should a tube fail in this mode, the equipment which it is protecting will very likely be damaged or destroyed. With tubes of present designs, failure in the high breakdown mode should not be frequent. As a result, a careful consideration of initial tube cost versus damaged equipment replacement cost should be made before indicating a selection in item 7.72.

7.73 (Item 7.73)

If gas tube protection is required because the protected equipment is sensitive to surge voltages less than those listed in paragraph 4, Part I, insert the dc and impulse breakdown voltage recommended by the equipment manufacturer. If tubes are being specified only to reduce maintenance (as described in TE&CM 823), specify a dc breakdown of 350V.

7.8 (Item 7.8)

The height of the verticals is self-explanatory.

7.9 (Item 7.9)

The length of cable that will be required to connect to the distributing frame may be critical to some suppliers and they will furnish it. This information must always be supplied.

8. POWER (ITEM 8)

8.1 (Items 8.1 - 8.2)

If continuous service is essential during commercial power failures, a storage battery and charger should be provided. This should be indicated by checking item 8.1. Otherwise, a battery eliminator can be furnished and so indicated by checking item 8.2.

8.2 (Item 8.3)

If there is additional load from electronic equipment such as carrier terminals or voice frequency repeaters and loop extenders, this should be indicated with the values.

8.3 (Item 8.4)

The available ac supply is self-explanatory.

8.4 (Item 8.5)

If batteries are to be supplied, then the length of time until failure of the PABX is important. In locations such as hospitals there will normally be standby ac power and, therefore, the busy hour capacity of the battery is probably three hours or less. If there is no standby ac and it is essential to have continuous service, then a busy hour reserve up to 8 busy hours would not be unreasonable.

9. FLOOR PLAN (ITEM 9)

9.1 A floor plan is necessary and all information required in item 9.1 must be given.

10. SPECIAL FEATURES (ITEM 10)

10.1 Each of these features are explained in Part II of the specification. Not all suppliers can supply all of them and they may use different designations on the ones they can, so care should be taken in ordering these and make certain the user has a definite need.

11. EXPLANATORY NOTES (ITEM 11)

11.1 Any special features or details that are relative to the installation for which no fill-in has been provided should be carefully explained here. Add pages as necessary.